Field Report for 2016 SPME Porewater Sampling and Surface Sediment Sampling
River Mile 10.9 Removal Action
Lower Passaic River Study Area

December 8, 2016

This field report describes the solid-phase microextraction (SPME) porewater sampling and surface sediment sampling performed of the cap at the River Mile 10.9 (RM 10.9) Removal Area. The SPME samplers were deployed over three days in June 2016 and were recovered over three days in August 2016. During SPME sampler recovery, samples of surface sediments that had accumulated since cap construction were also collected. A representative of Region 2 (from CDM Smith) was present during all field activities. This field report also describes the visual cap inspection performed over two days in July 2016. This work was performed as described in the Lower Passaic River Study Area River Mile 10.9 Post-Construction Monitoring Quality Assurance Project Plan, Revision 2 (QAPP) submitted to US EPA Region 2 (Region 2) on April 12, 2016 and the draft River Mile 10.9 Removal Action Long-Term Monitoring and Maintenance Plan, Revision 2, submitted to Region 2 on April 12, 2016 (LTMMP). A subsequent revision to the QAPP (Revision 3) was submitted to Region 2 on August 18, 2016 and a subsequent revision to the LTMMP (Revision 3) was submitted to Region 2 on September 2, 2016. These documents are under Region 2 review.

SPME Porewater Sampling and Surface Sediment Sampling

SPME Sampler Deployment

SPME samplers were installed at ten sampling stations over three days from June 3 to 5, 2016. The sampler locations are shown on Figure 1. The samplers were installed at all locations by walking on the cap. The dates for sampler installation were selected at a monthly (lunar) low tide to maximize the area of the cap that could be accessed by foot. For the same reason, the times for sampler installation were selected at daytime low tides. Two sampler locations (609 and 610) could not be accessed by foot because the cap is narrow in this area and there is a fence near the shore. These two sampler locations, therefore, were accessed from a boat. Once at these locations, both were accessible for sampler installation by walking on the cap. Location 609 was underwater during the installation and because the water level rose rapidly, it was difficult to determine the thicknesses of all the cap layers at that location.

The SPME samplers were installed to monitor three units. These units and the associated proposed depth intervals from deep to shallow, as noted in the QAPP, are as follows:

- underlying sediments (approximately 31 to 36 inches below the top of the cap),
- cap active layer (approximately 15 to 20 inches below the top of the cap), and
- armor layer (approximately 2 to 7 inches below the top of the cap).

These proposed depths are approximate and are based on the specifications of the constructed cap. Probing and resistance to driving the samplers were used to approximate the depths and thicknesses of these units. Typically the top of the armor layer and the presence of the geotextile liner (bottom of armor layer and top of the cap active layer) could be distinguished. However, the contact between the cap active layer and underlying sediments could not be distinguished. Therefore, the target depth for the top of the screened interval of the active layer samplers was immediately below the geotextile and the top of the screened interval of the underlying sediment samplers was 16 inches below the geotextile based on the as-constructed thickness of the active layer (approximately 10 inches) plus 6 inches. Table 1 presents the porewater sampler installed depths. It also presents the estimated thicknesses of the surface sediment, habitat layer (if distinguishable from sediment), and armor layer, and the depth to the geotextile.

To avoid cross-contamination between depth intervals, each SPME sampler was deployed in a separate sampler and samplers were not stacked in one borehole. To the extent possible the samplers were inserted into the cap in a triangular pattern (one for each of the three depths). They were installed as close as possible and within approximately 2 feet of each other. The actual locations of the samplers depended on the results of probing conducted at the time of deployment and ability to penetrate to the desired depth.

Each SPME sampler consisted of nine SPME fibers of 15 centimeter length attached with polytetrafluoroethylene (PTFE) tape to a 1/8 inch diameter stainless steel rod. The fibers and rods were inserted into a Henry Sampler that was modified by the manufacturer by cutting additional slots into the sampler so that there was a 6-inch slotted interval. This 6-inch slotted interval matches the six inch screened interval of the AMS Soil Vapor Probes drive point tips used to install the samplers. The Henry Samplers were also manufactured without the cross T handles so that they could be sealed from surface water. The AMS Soil Vapor Probes with disposable drive point tips were advanced by driving with a slide hammer through the sediment to the desired sample depth. Following installation, the Henry Samplers were placed in the AMS Soil Vapor Probe casing which was then removed leaving the screened disposable tip and the Henry Sampler. The soft sediments at the surface collapsed around the Henry Samplers. A 4-inch diameter steel plate with set screw was then installed on the Henry Sampler with the steel plate resting on the sediment. The Henry sampler was then cut down to as close as possible to the sediment surface (generally less than six inches above the sediment surface), filled with deionized (DI) water, and then capped to prevent surface water from entering the sampler. Samplers were flagged with colored tape to indicate sampler depth.

Quality control samples included duplicate samples at each sample interval at location 603. The duplicate samples were installed in separate boreholes approximately 18 inches from the primary set of samplers. Additionally, one field blank was prepared and stored for the duration of the deployment. The photographic log from the sampler installation is included in Attachment A.

Midpoint Check

Midpoint checks of the samplers were performed at low tide over two days on July 6 to 7, 2016. All samplers were present and in good shape. Only small trash, such as plastic bags were snagged on some samplers. A few samplers were missing the sampler depth color tape and the tape was replaced as needed. For the most part, the metal disks placed around each sampler were covered with sediment but no significant accumulation was observed. All samplers were photographed and the photograph log is included in Attachment B.

Check after a Large Rain Event

On August 3, 2016, the samplers were checked from shore at low tide after a large rain event. All locations that were visible from shore appeared to be undamaged although some had acquired some small debris. The photograph log from this check is included in Attachment C.

Sampler Recovery

The SPME samplers were recovered over three days between August 19 and 22, 2016, approximately 75 to 79 days after deployment which conservatively exceeded the planned deployment duration of 60 days. Similar to sampler deployment, the samplers were recovered at a monthly low tide and at daily low tides. Additionally, all samplers were recovered by walking on the cap. Locations 609 and 610 were accessed by boat but the samplers were retrieved by walking on the cap. The photographic log from the sampler recovery is included in Attachment D.

Prior to sampler removal at each location, a surface sediment sample was collected. The surface sediment samples were located within 8 inches horizontally of the armor layer sampler at each location.

These samples were collected with clean stainless steel spoons into sample jars and homogenized within the sample jar. A composite of soft sediment from the surface to the top of the habitat layer of the cap was collected for analysis at locations where newly deposited soft sediment was present. There was no soft sediment at station 0608, so a sample of the top three inches of material was collected.

Prior to removal of each sampler, the height of the sampler above the sediment surface was measured. Soft sediment accumulated in small amounts (generally less than one inch) around several of the Henry Samplers during the course of the deployment. Upon removal, the Henry Sampler was rinsed with DI water to remove any sediment adhering to the outside of the sampler. The length of the sampler was then measured and the depth of the sample interval was determined by subtracting the height of the sampler above the sediment surface from the length of the sampler. The samplers were then wrapped in aluminum foil and transported to a processing area established on shore. The depths of the samplers at recovery are presented in Table 1.

At the processing area, the SPME fibers were removed from each sampler. The fibers were then rinsed with DI water. Where possible, the portions of fibers in contact with the PTFE tape were cut and removed and the total length of recovered fibers from each sampler was measured. These fiber lengths are included in Table 2.

Analytical Results

The SPME fibers and the surface sediment were analyzed for the following three constituents using the following analytical methods:

- 2,3,7,8-Tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD) using USEPA Method 1613B
- 2,2',5,5'-Tetrachlorobiphenyl (PCB 52) using USEPA Method 1668C
- Phenanthrene using modified California USEPA Air Resources Board Method 429

The SPME samples were analyzed by SGS-North America in Wilmington, NC. High Resolution Gas Chromatography and High Resolution Mass Spectrometry (HRMS/HRGC) and isotope dilution were used to maximize the analytical sensitivity and accuracy. Analyte mass in the SPME fibers was reported by the laboratory on a picogram (pg)/sample basis. The results for analyte mass were converted to porewater concentrations using values for partition coefficients for the polydimethylsiloxane (PDMS) sorbent presented in the QAPP. The SPME analytical results and calculated porewater concentrations are presented in Table 2. An example calculation is presented in Attachment E.

Visual Cap Inspection

A visual inspection of the cap was performed over two days on July 6 to 7, 2016 and concurrent with the SPME sampler mid-point check. This visual inspection included the following activities:

- Poling to confirm the presence of the armor layer along a series of transects oriented perpendicular to the shore; and
- Photographing the cap at low tide from the boat and from the shore.

Poling was performed during higher tides from a boat and at lower tides on foot.

Poling from the Boat

Poling from the boat was conducted over the course of two days on July 6 to 7, 2016. Poling was performed from the approximate locations of the SPME samplers to edge of the cap at the river channel. A long metal rod marked with tape every six inches was lowered into the water at locations along each transect. The coordinates of each poling location were measured with a GPS. Observations were recorded at each poled location of the depth of surface water over the sediment surface and the presence/absence of armor stone. Where possible, the depth to soft sediment and/or the habitat layer

above the armor stone were also recorded. Attempts were made to collect all three measurements (water depth, soft sediment thickness, habitat layer thickness) at coincident locations, however because the boat could only be maintained on location by adjusting the motor speed and direction, there is some spread in the measurement locations. The results of the poling are presented in Table 3.

Poling on Foot

Poling on foot was conducted during low tide on July 7, 2016. Poling was performed from the shore to each SPME location. Similar to the boat-based poling, GPS coordinates were collected at each of the on-foot poling locations and observations were made of the soft sediment thickness, habitat layer thickness and presence/absence of the armor layer (Table 3).

Photographic Documentation

The cap was photographed during the visual inspection. Photographs were taken during the morning low tide event on July 7, 2016 concurrent with the on-foot poling and mid-program inspection. The photograph log is included in Attachment F.

Results

Poling was conducted along 12 transects located perpendicular to shore. Ten transects passed through the SPME sampler stations and two transects were located at the approximate upstream and downstream cap boundaries. Figure 2 shows the transect locations and the poling locations.

The number of poling locations at each transect varied based on the transect length and ranged from 4 to 12. A total of 96 locations were poled for the presence of the armor layer. The armor layer was found at all but two locations (adjacent locations on Transect B) near the navigation channel. At these two locations, it is believed that the pole was pushed through the sand layer and encountered the geotextile. The armor layer appeared less dense at one additional location (end of Transect E) also near the navigation channel and possibly at the edge of or off the cap. At this location the armor layer was encountered by moving the poling rod a short distance (approximately one foot or less). These locations are shown on Figure 2.

Tables

Table 1
Porewater Sampler Depths and Probing Results
River Mile 10.9 Removal Action
Lower Passaic River Study Area

Location	Sampler	Sampler ID	Soft Sediment Thickness (in)	Habitat Layer Thickness (in)	Armor Layer Thickness (in)	Geotextile Depth (in)	Depth to Bottom of Sampler, Deployment (in)	Depth to Bottom of Sampler, Retrieval (in)
601	Armor	16A-0601-E1-AS	5	1	5.5	11.5	11.5	11.5
	Active	16A-0601-E2-BS	5	1	5.5	11.5	18.5	15.75
	Sediment	16A-0601-E3-CS	5	1	5.5	11.5	27.5	28.75
602	Armor	16A-0602-E1-AS	9.5	0.75	14.75	25	25	24.5
	Active	16A-0602-E2-BS	9.5	0.75	14.75	25	32	31.5
	Sediment	16A-0602-E3-CS	9.5	0.75	14.75	25	43	42.5
603	Armor	16A-0603-E1-AS	11.5	4	5	20.5	20.5	20
	Active	16A-0603-E2-BS	15	1	5	21	27.5	26.75
	Sediment	16A-0603-E3-CS	12.5	0	10.5	23	40	39.75
603 dup	Armor	16A-0603-E1-AT	12	5	3.5	20.5	19.5	19.25
	Active	16A-0603-E2-BT	11	3.5	6	20.5	27	26
	Sediment	16A-0603-E3-CT	14	2.5	5	21.5	38	38.25
604	Armor	16A-0604-E1-AS	18.5	3.5	3	25	23	21.5
	Active	16A-0604-E2-BS	18.5	3.5	3	25	30.25	29.75
	Sediment	16A-0604-E3-CS	18.5	3.5	3	25	43	42.75
605	Armor	16A-0605-E1-AS	10	6	10.5	26.5	25	23.75
	Active	16A-0605-E2-BS	10.5	0	16	26.5	32.5	31.5
	Sediment	16A-0605-E3-CS	10	4.5	12	26.5	45	41
606	Armor	16A-0606-E1-AS	13.5	4	0*	17.5	17.5	19.5
	Active	16A-0606-E2-BS	13.5	4	0*	17.5	24.5	23.25
	Sediment	16A-0606-E3-CS	NM	NM	4	22	38.5	41
607	Armor	16A-0607-E1-AS	7	3.5	0**	10.5	10.5	9.75
	Active	16A-0607-E2-BS	7	3.5	0**	10.5	17.5	16.75
	Sediment	16A-0607-E3-CS	7	3.5	0**	10.5	32.5	34.75
608	Armor	16A-0608-E1-AS	0	4.5	11	15.5	12	12
	Active	16A-0608-E3-BS	2	3.5	9	14.5	21.5	23.5
	Sediment	16A-0608-E2-CS	1.5	4.5	8	14	32	32
609	Armor	16A-0609-E1-AS	17.5	not distinguishable	5.5	23	21.5	20.75
	Active	16A-0609-E2-BS	NM	NM	NM	27.5	34.5	32
	Sediment	16A-0609-E3-CS	NM	NM	NM	20	38	40.25
610	Armor	16A-0610-E1-AS	5	1	4	10	9.5	8.75
	Active	16A-0610-E2-BS	5	1	4	10	16.5	16.75
	Sediment	16A-0610-E3-CS	5	1	4	10	26.5	26

NM - Not Measured

Screened interval of porewater samplers is 6 inches.

Location 609 was underwater during the installation and because the water level rose rapidly, it was difficult to determine the thicknesses of all the cap layers at that location.

* Armor layer encountered within 6 inches of location.

**Additional probing on 6/5/16 revealed armor within 5 foot radius of station 607 installed samplers.

Table 2
SPME PDMS Sorbent and Surface Sediment Analytical Results
River Mile 10.9 Removal Action
Lower Passaic River Study Area

Location			16A-0601				16A-0602			
layer_sampled			Armor Layer	Cap Active Layer	Underlying Sediment	Surface Sediment	Armor Layer	Cap Active Layer	Underlying Sediment	Surface Sediment
sys_loc_code			16A-0601-E1	16A-0601-E2	16A-0601-E3	16A-0601-S1	16A-0602-E1	16A-0602-E2	16A-0602-E3	16A-0602-S1
sys_sample_code			16A-0601-E1-AS	16A-0601-E2-BS	16A-0601-E3-CS	16A-0601-S1-AS	16A-0602-E1-AS	16A-0602-E2-BS	16A-0602-E3-CS	16A-0602-S1-AS
sample deployment_date			6/4/2016	6/4/2016	6/4/2016	NA	6/5/2016	6/5/2016	6/5/2016	NA
sample retrival_date		QAPP EDL Estimate	8/20/2016	8/20/2016	8/20/2016	8/20/2016	8/20/2016	8/20/2016	8/20/2016	8/20/2016
matrix_code			SPME	SPME	SPME	SE	SPME	SPME	SPME	SE
sample_type_code			N	N	N	N	N	N	N	N
fiber_length (mm)			1514.9	1594.4	1599.7	-	1598.4	1609.3	1707.5	-
report_result_unit										
Phenanthrene										
Mass in SPME PDMS Sorbent	ng	9.9	18.3 J+	9.63 J+	5.41 J+	-	6.98 J+	4.86 J+	59.9	-
Concentration in Sediment	ng/g	-	-	-	-	2270 J	-	-	-	2010 J
Calculated Concentration in Porewater	ng/L	-	45 J+	23 J+	13 J+	-	16 J+	11 J+	130	-
PCB-52										
Mass in SPME PDMS Sorbent	pg	45	1740	294	2550	-	388	245	29900	-
Concentration in Sediment	pg/g	-	-	-	-	27100 J	-	-	-	25400 J
Calculated Concentration in Porewater	pg/L	-	84	14	120	-	18	11	1300	-
2,3,7,8-TCDD										
Mass in SPME PDMS Sorbent	pg	17	< 1.84 U	< 2.46 U	< 2.09 U	-	< 3.58 U	< 2.3 U	12.5	-
Concentration in Sediment	pg/g	-	-	-	-	196 J	-	-	-	218 J
Calculated Concentration in Porewater	pg/L	-	< 0.036 U	< 0.045 U	< 0.038 U	-	< 0.065 U	< 0.042 U	0.21	-
Total Organic Carbon										
Total Organic Carbon[2]	%					7.00				7.33

Notes:
Sample type: N - sample, FD - field duplicate, FB - field blank
Matrix code: SPME - Solid Phase Micro Extraction , SE - sediment
PDMS - polydimethylsiloxane
EDL - Estimated Detection Limit
mm - millimeter
ng - nanogram
ng/g - nanogram per gram
ng/L - nanogram per liter
pg - picogram
pg/g - picogram per gram
pg/L - picogram per liter
L/kg - liter per kilogram
U = The analyte was analyzed for, but was not detected above the reported sample detection limit.
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
J+ = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample and is potentially biased high.
Z = EMPC-J = The analyte is identified as an estimated maximum possible concentration; the associated numerical value is the approximate concentration of the analyte in the sample.
[1] Samplers installed through overlying water; control of sampler depths and thickness of layers is less certain than at other locations where the samplers were installed without significant overlying water.
[2] Average of duplicate samples
Porewater concentration calculated using equation:
(Mass in SPME PDMS Sorbent/((PI()*0.15^2)-(PI()*0.10^2)) *fiber length))/ KPDMS
where K_{PDMS} is 6,761 L/kg for phenanthrene, 346,737 L/kg for PCB-52, and 870,964 L/kg for 2,3,7,8-TCDD.

Table 2
SPME PDMS Sorbent and Surface Sediment Analytical Results
River Mile 10.9 Removal Action
Lower Passaic River Study Area

Location			16A-0603 and Duplicate							
layer_sampled			Armor Layer		Cap Active Layer		Underlying Sediment		Surface Sediment	
sys_loc_code			16A-0603-E1	16A-0603-E1	16A-0603-E2	16A-0603-E2	16A-0603-E3	16A-0603-E3	16A-0603-S1	16A-0603-S1
sys_sample_code			16A-0603-E1-AS	16A-0603-E1-AT	16A-0603-E2-BS	16A-0603-E2-BT	16A-0603-E3-CS	16A-0603-E3-CT	16A-0603-S1-AS	16A-0603-S1-AT
sample deployment_date			6/5/2016	6/5/2016	6/5/2016	6/5/2016	6/5/2016	6/5/2016	NA	NA
sample retrival_date		QAPP EDL Estimate	8/20/2016	8/20/2016	8/20/2016	8/20/2016	8/20/2016	8/20/2016	8/20/2016	8/20/2016
matrix_code			SPME	SPME	SPME	SPME	SPME	SPME	SE	SE
sample_type_code			N	FD	N	FD	N	FD	N	FD
fiber_length (mm)			1549	1623.8	1435.3	1599.8	1593.4	1418.5	-	-
report_result_unit										
Phenanthrene										
Mass in SPME PDMS Sorbent	ng	9.9	13.1 J+	11.7 J+	5.15 J+	< 4 U	84.5 J	26.8 J	-	-
Concentration in Sediment	ng/g	-	-	-	-	-	-	-	2180 J	2270 J
Calculated Concentration in Porewater	ng/L	-	32 J+	27 J+	14 J+	< 9.4 U	200 J	71 J	-	-
PCB-52										
Mass in SPME PDMS Sorbent	pg	45	691	872	130 J	77.4 J	14900	14900	-	-
Concentration in Sediment	pg/g	-	-	-	-	-	-	-	26300 J	28400 J
Calculated Concentration in Porewater	pg/L	-	33	39	6.7 J	3.6 J	690	770	-	-
2,3,7,8-TCDD										
Mass in SPME PDMS Sorbent	pg	17	< 2.23 U	< 4.03 U	< 2.23 U	< 4.58 U	< 2.37 U	10 J	-	-
Concentration in Sediment	pg/g	-	-	-	-	-	-	-	232 J	209 J
Calculated Concentration in Porewater	pg/L	-	< 0.042 U	< 0.073 U	< 0.045 U	< 0.084 U	< 0.043 U	0.21 J	-	-
Total Organic Carbon										
Total Organic Carbon[2]	%								7.60	7.33

Notes:
Sample type: N - sample, FD - field duplicate, FB - field blank
Matrix code: SPME - Solid Phase Micro Extraction , SE - sediment
PDMS - polydimethylsiloxane
EDL - Estimated Detection Limit
mm - millimeter
ng - nanogram
ng/g - nanogram per gram
ng/L - nanogram per liter
pg - picogram
pg/g - picogram per gram
pg/L - picogram per liter
L/kg - liter per kilogram
U = The analyte was analyzed for, but was not detected above the reported sample detection limit.
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
J+ = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample and is potentially biased high.
Z = EMPC-J = The analyte is identified as an estimated maximum possible concentration; the associated numerical value is the approximate concentration of the analyte in the sample.
[1] Samplers installed through overlying water; control of sampler depths and thickness of layers is less certain than at other locations where the samplers were installed without significant overlying water.
[2] Average of duplicate samples
Porewater concentration calculated using equation:
(Mass in SPME PDMS Sorbent/((PI()*0.15^2)-(PI()*0.10^2)) *fiber length))/ KPDMS
where K_{PDMS} is 6,761 L/kg for phenanthrene, 346,737 L/kg for PCB-52, and 870,964 L/kg for 2,3,7,8-TCDD.

Table 2
SPME PDMS Sorbent and Surface Sediment Analytical Results
River Mile 10.9 Removal Action
Lower Passaic River Study Area

Location			16A-0604				16A-0605			
layer_sampled			Armor Layer	Cap Active Layer	Underlying Sediment	Surface Sediment	Armor Layer	Cap Active Layer	Underlying Sediment	Surface Sediment
sys_loc_code			16A-0604-E1	16A-0604-E2	16A-0604-E3	16A-0604-S1	16A-0605-E1	16A-0605-E2	16A-0605-E3	16A-0605-S1
sys_sample_code			16A-0604-E1-AS	16A-0604-E2-BS	16A-0604-E3-CS	16A-0604-S1-AS	16A-0605-E1-AS	16A-0605-E2-BS	16A-0605-E3-CS	16A-0605-S1-AS
sample deployment_date			6/4/2016	6/4/2016	6/4/2016	NA	6/4/2016	6/4/2016	6/4/2016	NA
sample retrival_date		QAPP EDL Estimate	8/20/2016	8/20/2016	8/20/2016	8/20/2016	8/20/2016	8/20/2016	8/20/2016	8/20/2016
matrix_code			SPME	SPME	SPME	SE	SPME	SPME	SPME	SE
sample_type_code			N	N	N	N	N	N	N	N
fiber_length (mm)			1548.3	1558	1630.4	-	1456.2	1564.3	1458	-
report_result_unit										
Phenanthrene										
Mass in SPME PDMS Sorbent	ng	9.9	17.2 J+	5.18 J+	< 4 U	-	24 J+	5.79 J+	< 4 U	-
Concentration in Sediment	ng/g	-	-	-	-	2230 J	-	-	-	2170 J
Calculated Concentration in Porewater	ng/L	-	42 J+	13 J+	< 9.2 U	-	62 J+	14 J+	< 10 U	-
PCB-52										
Mass in SPME PDMS Sorbent	pg	45	1670	816	1120	-	1100	289	93.1 J+	-
Concentration in Sediment	pg/g	-	-	-	-	24100 J	-	-	-	26100 J
Calculated Concentration in Porewater	pg/L	-	79	38	50	-	55	14	4.7 J+	-
2,3,7,8-TCDD										
Mass in SPME PDMS Sorbent	pg	17	< 6.07 U	< 4.29 U	< 2.28 U	-	< 2.2 U	< 2.36 U	< 2.47 U	-
Concentration in Sediment	pg/g	-	-	-	-	199 J	-	-	-	215 J
Calculated Concentration in Porewater	pg/L	-	< 0.11 U	< 0.081 U	< 0.041 U	-	< 0.044 U	< 0.044 U	< 0.050 U	-
Total Organic Carbon										
Total Organic Carbon[2]	%					7.53				7.77

Notes:
Sample type: N - sample, FD - field duplicate, FB - field blank
Matrix code: SPME - Solid Phase Micro Extraction , SE - sediment
PDMS - polydimethylsiloxane
EDL - Estimated Detection Limit
mm - millimeter
ng - nanogram
ng/g - nanogram per gram
ng/L - nanogram per liter
pg - picogram
pg/g - picogram per gram
pg/L - picogram per liter
L/kg - liter per kilogram
U = The analyte was analyzed for, but was not detected above the reported sample detection limit.
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
J+ = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample and is potentially biased high.
Z = EMPC-J = The analyte is identified as an estimated maximum possible concentration; the associated numerical value is the approximate concentration of the analyte in the sample.
[1] Samplers installed through overlying water; control of sampler depths and thickness of layers is less certain than at other locations where the samplers were installed without significant overlying water.
[2] Average of duplicate samples
Porewater concentration calculated using equation:
(Mass in SPME PDMS Sorbent/((PI()*0.15^2)-(PI()*0.10^2)) *fiber length))/ KPDMS
where K_{PDMS} is 6,761 L/kg for phenanthrene, 346,737 L/kg for PCB-52, and 870,964 L/kg for 2,3,7,8-TCDD.

Table 2
SPME PDMS Sorbent and Surface Sediment Analytical Results
River Mile 10.9 Removal Action
Lower Passaic River Study Area

Location			16A-0606				16A-0607			
layer_sampled			Armor Layer	Cap Active Layer	Underlying Sediment	Surface Sediment	Armor Layer	Cap Active Layer	Underlying Sediment	Surface Sediment
sys_loc_code			16A-0606-E1	16A-0606-E2	16A-0606-E3	16A-0606-S1	16A-0607-E1	16A-0607-E2	16A-0607-E3	16A-0607-S1
sys_sample_code			16A-0606-E1-AS	16A-0606-E2-BS	16A-0606-E3-CS	16A-0606-S1-AS	16A-0607-E1-AS	16A-0607-E2-BS	16A-0607-E3-CS	16A-0607-S1-AS
sample deployment_date			6/3/2016	6/3/2016	6/3/2016	NA	6/3/2016	6/3/2016	6/3/2016	NA
sample retrival_date		QAPP EDL Estimate	8/19/2016	8/19/2016	8/19/2016	8/19/2016	8/19/2016	8/19/2016	8/19/2016	8/19/2016
matrix_code			SPME	SPME	SPME	SE	SPME	SPME	SPME	SE
sample_type_code			N	N	N	N	N	N	N	N
fiber_length (mm)			1604.3	1560.5	1569.9	-	1635.3	1569.9	1571.6	-
report_result_unit										
Phenanthrene										
Mass in SPME PDMS Sorbent	ng	9.9	22.3 J+	8.74 J+	7.81 J+	-	30.9	4.4 J+	5.34 J+	-
Concentration in Sediment	ng/g	-	-	-	-	2100 J	-	-	-	1190 J
Calculated Concentration in Porewater	ng/L	-	52 J+	21 J+	19 J+	-	71	11 J+	13 J+	-
PCB-52										
Mass in SPME PDMS Sorbent	pg	45	1290	475	2440	-	2790	192	2030	-
Concentration in Sediment	pg/g	-	-	-	-	22700 J	-	-	-	10100
Calculated Concentration in Porewater	pg/L	-	59	22	110	-	130	9	95	-
2,3,7,8-TCDD										
Mass in SPME PDMS Sorbent	pg	17	< 5.19 U	< 9.17 U	< 5.91 U	-	< 5.14 U	< 10.7 U	< 4.48 U	-
Concentration in Sediment	pg/g	-	-	-	-	225 J	-	-	-	195
Calculated Concentration in Porewater	pg/L	-	< 0.095 U	< 0.17 U	< 0.11 U	-	< 0.092 U	< 0.20 U	< 0.083 U	-
Total Organic Carbon										
Total Organic Carbon[2]	%					7.20				4.47

Notes:
Sample type: N - sample, FD - field duplicate, FB - field blank
Matrix code: SPME - Solid Phase Micro Extraction , SE - sediment
PDMS - polydimethylsiloxane
EDL - Estimated Detection Limit
mm - millimeter
ng - nanogram
ng/g - nanogram per gram
ng/L - nanogram per liter
pg - picogram
pg/g - picogram per gram
pg/L - picogram per liter
L/kg - liter per kilogram
U = The analyte was analyzed for, but was not detected above the reported sample detection limit.
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
J+ = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample and is potentially biased high.
Z = EMPC-J = The analyte is identified as an estimated maximum possible concentration; the associated numerical value is the approximate concentration of the analyte in the sample.
[1] Samplers installed through overlying water; control of sampler depths and thickness of layers is less certain than at other locations where the samplers were installed without significant overlying water.
[2] Average of duplicate samples
Porewater concentration calculated using equation:
(Mass in SPME PDMS Sorbent/((PI()*0.15^2)-(PI()*0.10^2)) *fiber length))/ KPDMS
where K_{PDMS} is 6,761 L/kg for phenanthrene, 346,737 L/kg for PCB-52, and 870,964 L/kg for 2,3,7,8-TCDD.

Table 2
SPME PDMS Sorbent and Surface Sediment Analytical Results
River Mile 10.9 Removal Action
Lower Passaic River Study Area

Location			16A-0608				16A-0609[1]			
layer_sampled			Armor Layer	Cap Active Layer	Underlying Sediment	Surface Sediment	Armor Layer	Cap Active Layer	Underlying Sediment	Surface Sediment
sys_loc_code			16A-0608-E1	16A-0608-E3	16A-0608-E2	16A-0608-S1	16A-0609-E1	16A-0609-E2	16A-0609-E3	16A-0609-S1
sys_sample_code			16A-0608-E1-AS	16A-0608-E3-BS	16A-0608-E2-CS	16A-0608-S1-AS	16A-0609-E1-AS	16A-0609-E2-BS	16A-0609-E3-CS	16A-0609-S1-AS
sample deployment_date			6/4/2016	6/4/2016	6/4/2016	NA	6/3/2016	6/3/2016	6/3/2016	NA
sample retrival_date		QAPP EDL Estimate	8/19/2016	8/19/2016	8/19/2016	8/19/2016	8/19/2016	8/19/2016	8/19/2016	8/19/2016
matrix_code			SPME	SPME	SPME	SE	SPME	SPME	SPME	SE
sample_type_code			N	N	N	N	N	N	N	N
fiber_length (mm)			1522.1	1333.2	1559.1	-	1596.1	1597.6	1634.7	-
report_result_unit										
Phenanthrene										
Mass in SPME PDMS Sorbent	ng	9.9	13.1 J+	5.43 J+	< 4 U	-	10.6 J+	12.2 J+	47	-
Concentration in Sediment	ng/g	-	-	-	-	546 J	-	-	-	1950 J
Calculated Concentration in Porewater	ng/L	-	32 J+	15 J+	< 9.7 U	-	25 J+	29 J+	110	-
PCB-52										
Mass in SPME PDMS Sorbent	pg	45	387	75.1 J+	34.4 J+	-	4630	26700	26500	-
Concentration in Sediment	pg/g	-	-	-	-	4120	-	-	-	5370
Calculated Concentration in Porewater	pg/L	-	19	4.1 J+	1.6 J+		210	1200	1200	-
2,3,7,8-TCDD										
Mass in SPME PDMS Sorbent	pg	17	< 3.99 U	< 3.47 U	< 4.29 U	-	< 8.19 U	18.7 Z	23 Z	-
Concentration in Sediment	pg/g	-	-	-	-	51.5	-	-	-	39.9
Calculated Concentration in Porewater	pg/L	-	< 0.077 U	< 0.076 U	< 0.080 U	-	< 0.15 U	0.34 Z	0.41 Z	-
Total Organic Carbon										
Total Organic Carbon[2]	%					1.92				1.85

Notes:
Sample type: N - sample, FD - field duplicate, FB - field blank
Matrix code: SPME - Solid Phase Micro Extraction , SE - sediment
PDMS - polydimethylsiloxane
EDL - Estimated Detection Limit
mm - millimeter
ng - nanogram
ng/g - nanogram per gram
ng/L - nanogram per liter
pg - picogram
pg/g - picogram per gram
pg/L - picogram per liter
L/kg - liter per kilogram
U = The analyte was analyzed for, but was not detected above the reported sample detection limit.
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
J+ = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample and is potentially biased high.
Z = EMPC-J = The analyte is identified as an estimated maximum possible concentration; the associated numerical value is the approximate concentration of the analyte in the sample.

[1] Samplers installed through overlying water; control of sampler depths and thickness of layers is less certain than at other locations where the samplers were installed without significant overlying water.

[2] Average of duplicate samples

Porewater concentration calculated using equation:
(Mass in SPME PDMS Sorbent/((PI()*0.15^2)-(PI()*0.10^2)) *fiber length))/ KPDMS
where K_{PDMS} is 6,761 L/kg for phenanthrene, 346,737 L/kg for PCB-52, and 870,964 L/kg for 2,3,7,8-TCDD.

Table 2
SPME PDMS Sorbent and Surface Sediment Analytical Results
River Mile 10.9 Removal Action
Lower Passaic River Study Area

			16A-0610				Field Blank
Location							
layer_sampled			Armor Layer	Cap Active Layer	Underlying Sediment	Surface Sediment	
sys_loc_code			16A-0610-E1	16A-0610-E2	16A-0610-E3	16A-0610-S1	
sys_sample_code			16A-0610-E1-AS	16A-0610-E2-BS	16A-0610-E3-CS	16A-0610-S1-AS	16A-0BLK-E1-XF
sample deployment_date			6/3/2016	6/3/2016	6/3/2016	NA	6/3/2016
sample retrival_date		QAPP EDL Estimate	8/19/2016	8/19/2016	8/19/2016	8/19/2016	8/20/2016
matrix_code			SPME	SPME	SPME	SE	SPME
sample_type_code			N	N	N	N	FB
fiber_length (mm)			1109.6	1468.2	1593.9	-	1639.7
report_result_unit							
Phenanthrene							
Mass in SPME PDMS Sorbent	ng	9.9	17.1 J+	4.73 J+	11.4 J+	-	4.91
Concentration in Sediment	ng/g	-	-	-	-	1310 J	-
Calculated Concentration in Porewater	ng/L	-	58 J+	12 J+	27 J+	-	11
PCB-52							
Mass in SPME PDMS Sorbent	pg	45	531	294	20000	-	28.3 Z
Concentration in Sediment	pg/g	-	-	-	-	16500 J	-
Calculated Concentration in Porewater	pg/L	-	35	15	920	-	1.3 Z
2,3,7,8-TCDD							
Mass in SPME PDMS Sorbent	pg	17	< 1.96 U	< 2.06 U	28	-	< 2.2 U
Concentration in Sediment	pg/g	-	-	-	-	167 J	-
Calculated Concentration in Porewater	pg/L	-	< 0.052 U	< 0.041 U	0.51	-	< 0.039 U
Total Organic Carbon							
Total Organic Carbon[2]	%					6.06	

Notes:
Sample type: N - sample, FD - field duplicate, FB - field blank
Matrix code: SPME - Solid Phase Micro Extraction , SE - sediment
PDMS - polydimethylsiloxane
EDL - Estimated Detection Limit
mm - millimeter
ng - nanogram
ng/g - nanogram per gram
ng/L - nanogram per liter
pg - picogram
pg/g - picogram per gram
pg/L - picogram per liter
L/kg - liter per kilogram
U = The analyte was analyzed for, but was not detected above the reported sample detection limit.
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
J+ = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample and is potentially biased high.
Z = EMPC-J = The analyte is identified as an estimated maximum possible concentration; the associated numerical value is the approximate concentration of the analyte in the sample.
[1] Samplers installed through overlying water; control of sampler depths and thickness of layers is less certain than at other locations where the samplers were installed without significant overlying water.
[2] Average of duplicate samples
Porewater concentration calculated using equation:
(Mass in SPME PDMS Sorbent/((PI()*0.15^2)-(PI()*0.10^2)) *fiber length))/ KPDMS
where K_{PDMS} is 6,761 L/kg for phenanthrene, 346,737 L/kg for PCB-52, and 870,964 L/kg for 2,3,7,8-TCDD.

Table 3
RM 10.9 Poling Results
River Mile 10.9 Removal Action
Lower Passaic River Study Area

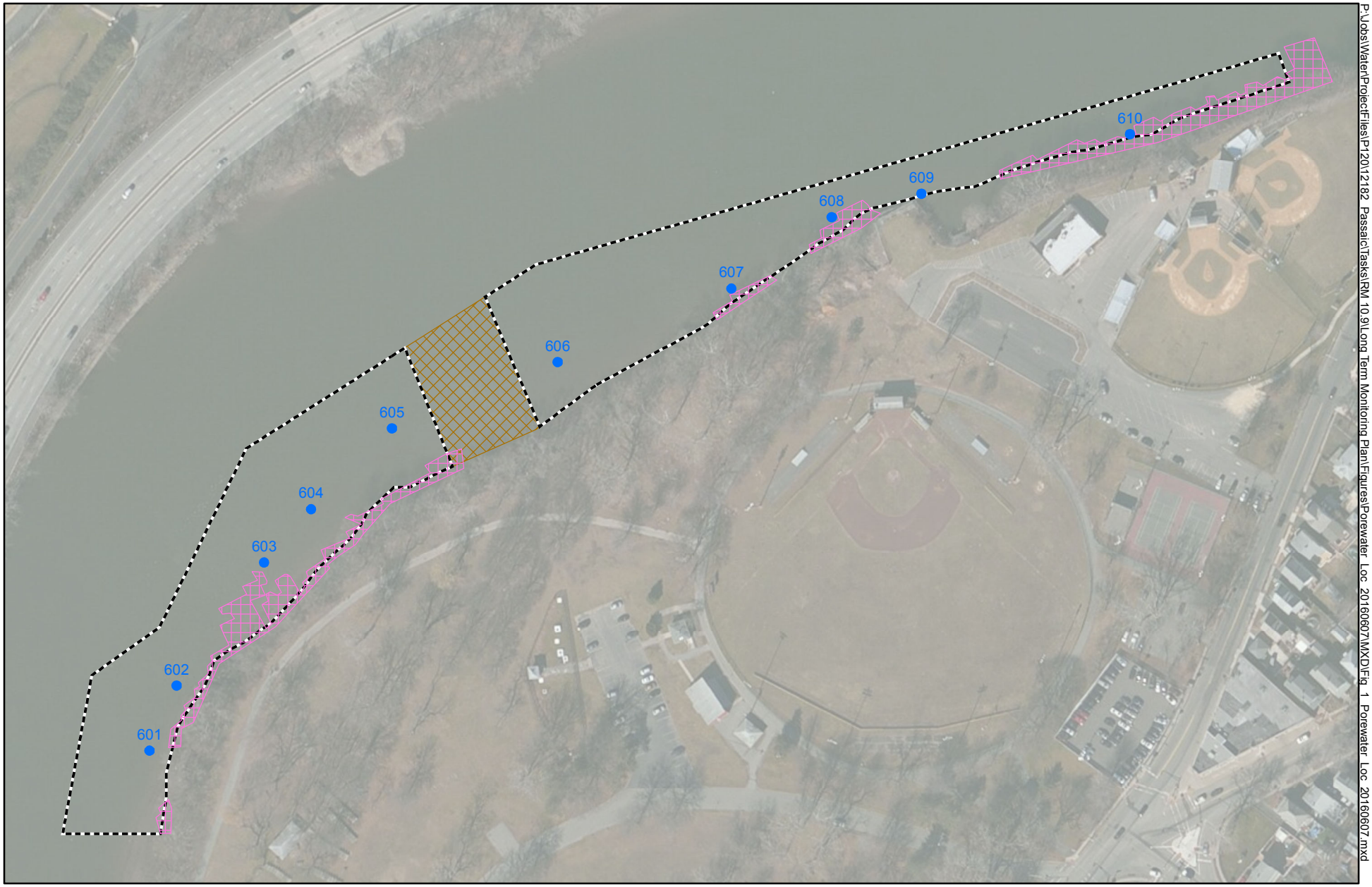
Comment	Date	Time	Poling Approach	Surface Water Depth (ft)	Soft Sediment Thickness (ft)	Habitat Layer Thickness (ft)	Depth to Armor Layer (ft)	Notes
A-1	06-Jul-16	11:13:20am	Boat	NM	NM	NM	NM	Cap Edge (too deep) >36 ft
A-10f	07-Jul-16	06:52:15am	Foot	0	0.4	0.3	0.7	
A-11f	07-Jul-16	06:55:09am	Foot	0	0.5	0.5	1.0	
A-2	06-Jul-16	11:08:50am	Boat	NM	NM	NM	11.8	
A-3	06-Jul-16	11:15:51am	Boat	NM	NM	NM	12.6	
A-4	06-Jul-16	11:20:08am	Boat	NM	NM	NM	12.5	
A-5	06-Jul-16	11:22:08am	Boat	NM	NM	NM	14.5	
A-6	06-Jul-16	11:26:03am	Boat	NM	NM	NM	8.5	
A-7	06-Jul-16	03:23:44pm	Boat	7.2	ND	ND	8.4	
A-8	06-Jul-16	03:29:26pm	Boat	3.7	2.4	0	6.1	Sand and armor mixed
A-9f	07-Jul-16	06:50:22am	Foot	0	0.7	0	0.7	
B-1	06-Jul-16	11:36:35am	Boat	NM	NM	NM	10.6	
B-10f	07-Jul-16	06:45:59am	Foot	0	0.5	0.4	1.0	
B-2	06-Jul-16	11:38:29am	Boat	NM	NM	NM	7.5	
B-3	06-Jul-16	11:40:48am	Boat	NM	NM	NM	8.1	
B-4	06-Jul-16	03:33:58pm	Boat	NM	ND	ND	Not found	No armor, sand at 7.5 ft
B-5	06-Jul-16	03:36:52pm	Boat	NM	NM	NM	Not found	No armor
B-6	06-Jul-16	03:39:24pm	Boat	NM	NM	NM	7.7	
B-7	06-Jul-16	03:41:45pm	Boat	3	1.2	0.7	4.8	
B-8	06-Jul-16	03:44:37pm	Boat	NM	NM	NM	6.8	
B-9f	07-Jul-16	06:44:36am	Foot	0	0.7	0.3	1.0	
C-1	06-Jul-16	11:48:22am	Boat	NM	NM	NM	10.3	
C-2	06-Jul-16	11:50:47am	Boat	NM	NM	NM	8.7	2.5 ft silt observed on rod
C-3	06-Jul-16	11:52:36am	Boat	NM	NM	NM	7.6	
C-4	06-Jul-16	03:59:31pm	Boat	4.2	2.1	1.1	7.3	
C-5	06-Jul-16	04:03:14pm	Boat	2	1.9	0.4	4.3	
C-7f	07-Jul-16	06:38:07am	Foot	0	0.7	0.4	1.1	
C-8f	07-Jul-16	06:39:43am	Foot	0	1.1	0.3	1.3	
D-1	06-Jul-16	12:00:51am	Boat	NM	NM	NM	7.6	
D-10f	07-Jul-16	06:31:22am	Foot	0	1.6	0.3	1.8	
D-2	06-Jul-16	12:03:17am	Boat	NM	NM	NM	7.9	
D-3	06-Jul-16	12:06:10am	Boat	NM	NM	NM	9.5	
D-4	06-Jul-16	12:11:47am	Boat	NM	NM	NM	11.6	
D-5	06-Jul-16	12:15:23am	Boat	NM	NM	NM	7.7	> 2 ft silt observed on rod
D-6	06-Jul-16	04:12:19pm	Boat	NM	NM	NM	8.3	
D-7	06-Jul-16	04:14:09pm	Boat	2.2	2.2	2.1	6.4	
D-8f	07-Jul-16	06:28:00am	Foot	0	0.5	0.3	0.8	
D-9f	07-Jul-16	06:29:10am	Foot	NM	1.2	5.4	1.6	
E-1	06-Jul-16	04:25:33pm	Boat	1.7	0.3	3.4	5.3	
E-2	06-Jul-16	04:30:54pm	Boat	NM	NM	NM	6.7	
E-3f	07-Jul-16	06:18:53am	Foot	0	0.2	0.5	0.7	
E-4f	07-Jul-16	06:20:42am	Foot	0	0.9	0.5	1.4	
E-5f	07-Jul-16	06:22:28am	Foot	0	1.0	0.3	1.3	
E-6	07-Jul-16	09:42:39am	Boat	NM	NM	NM	6.7	
E-7	07-Jul-16	09:48:33am	Boat	4.8	ND	ND	6.8	
E-8	07-Jul-16	10:00:03am	Boat	NM	NM	NM	1.0	Spotty armor area--edge of cap
F-1	06-Jul-16	04:34:47pm	Boat	NM	NM	NM	6.7	
F-10	07-Jul-16	10:31:44am	Boat	NM	NM	NM	6.6	
F-11	07-Jul-16	10:33:47am	Boat	NM	NM	NM	9.2	
F-12	07-Jul-16	10:36:11am	Boat	NM	NM	NM	9.1	
F-2	06-Jul-16	04:36:41pm	Boat	2.5	4.2	1.5	8.2	
F-3f	07-Jul-16	05:50:32am	Foot	0	0.5	0.3	0.8	
F-4f	07-Jul-16	05:51:36am	Foot	0	0.6	0.3	0.9	
F-5f	07-Jul-16	05:53:39am	Foot	0	1.0	0.5	1.5	
F-6	07-Jul-16	10:13:40am	Boat	5.5	ND	0.8	6.3	
F-7	07-Jul-16	10:16:19am	Boat	NM	NM	NM	10.3	
F-8	07-Jul-16	10:22:03am	Boat	NM	NM	NM	9.5	
F-9	07-Jul-16	10:29:39am	Boat	NM	NM	NM	6.7	
G-1	06-Jul-16	04:51:36pm	Boat	NM	NM	NM	4.9	
G-2	06-Jul-16	04:54:19pm	Boat	1.6	1.0	0.1	2.7	
G-3f	07-Jul-16	06:01:26am	Foot	0	0.7	0.2	0.9	
G-4f	07-Jul-16	06:04:59am	Foot	0	0.8	0.3	1.2	
G-5	07-Jul-16	10:54:23am	Boat	NM	NM	NM	8.8	
G-6	07-Jul-16	10:58:24am	Boat	NM	NM	NM	7.8	
H-1	06-Jul-16	04:59:41pm	Boat	2.3	1.3	0.9	4.5	
H-2	06-Jul-16	05:02:43pm	Boat	NM	NM	NM	4.8	
H-3f	07-Jul-16	06:07:35am	Foot	0	ND	ND	1.0	
H-4f	07-Jul-16	06:08:58am	Foot	0	ND	ND	0.9	
H-5	07-Jul-16	11:04:01am	Boat	NM	NM	NM	8.0	
H-6	07-Jul-16	11:06:14am	Boat	NM	NM	NM	9.3	
I-1	06-Jul-16	02:11:27pm	Boat	4.5	0.8	0.4	5.7	
I-2	06-Jul-16	02:16:56pm	Boat	5	0.7	0.8	6.6	
I-3	06-Jul-16	02:22:58pm	Boat	NM	ND	ND	9.2	Spotty armor area--edge of cap
I-4	06-Jul-16	02:26:55pm	Boat	5	0.2	0	6.7	
I-5	06-Jul-16	05:09:08pm	Boat	0.02	0.0	0.3	0.5	
J-1	06-Jul-16	02:37:26pm	Boat	NM	ND	Not found	Not found	Off cap near transect J
J-2	06-Jul-16	02:42:13pm	Boat	6.7	0.3	0.3	7.3	
J-3	06-Jul-16	02:47:49pm	Boat	NM	NM	NM	10.6	
J-4	06-Jul-16	02:52:36pm	Boat	NM	NM	NM	8.1	
J-5	06-Jul-16	05:39:40pm	Boat	NM	NM	NM	2.6	
off cap	07-Jul-16	11:11:36am	Boat	NM	NM	NM	Not found	Off cap near transect Y
off cap	07-Jul-16	11:25:04am	Boat	NM	NM	NM	Not found	Off cap near transect X
off cap	07-Jul-16	11:27:50am	Boat	NM	NM	NM	Not found	Off cap near transect X
X-1f	07-Jul-16	07:01:33am	Foot	0	0.4	0.2	0.5	
X-2f	07-Jul-16	07:02:50am	Foot	0	0.6	0.3	1.0	
X-3f	07-Jul-16	07:04:18am	Foot	0	NM	NM	Not found	Off cap near transect X
X-4f	07-Jul-16	07:07:45am	Foot	0	0.6	0.1	0.7	
X-5f	07-Jul-16	07:07:07am	Foot	0	NM	NM	Not found	Off cap near transect X
X-6	07-Jul-16	11:23:53am	Boat	NM	NM	NM	11.0	
X-7	07-Jul-16	11:25:39am	Boat	NM	NM	NM	13.5	
X-8	07-Jul-16	11:28:27am	Boat	NM	NM	NM	12.0	
X-9	07-Jul-16	11:33:33am	Boat	NM	NM	NM	5.8	
Y-1	07-Jul-16	11:13:25am	Boat	NM	NM	NM	13.1	
Y-2	07-Jul-16	11:15:06am	Boat	NM	NM	NM	9.6	
Y-3	07-Jul-16	11:16:11am	Boat	NM	NM	NM	15.5	

Notes:
ND--Not Distinguishable
NM--Not Measured
All depths measured from surface of water.

Transects Corresponding SPME Stations:

D--604	G--607	J--610	A--601
E--605	H--608	X-Downstream Extent	B--602
F--606	I--609	Y--Upstream Extent	C--603

Figures



Porewater and Surface Sediment Sampling Location
Dredge/Cap Area
No Dredge Area
Hard Pan

0 50 100 200 300 Feet

N

Figure 1
Porewater and Surface Sediment Sampling Locations
June to August 2016 Deployment Period

AECOM

P:\Jobs\Water\ProjectFiles\P120112182_PassaicTasks\RM 10.9\Long Term Monitoring Plan\Figures\Porewater_Loc_20160607\MXD\Fig_1_Porewater_Loc_20160607.mxd

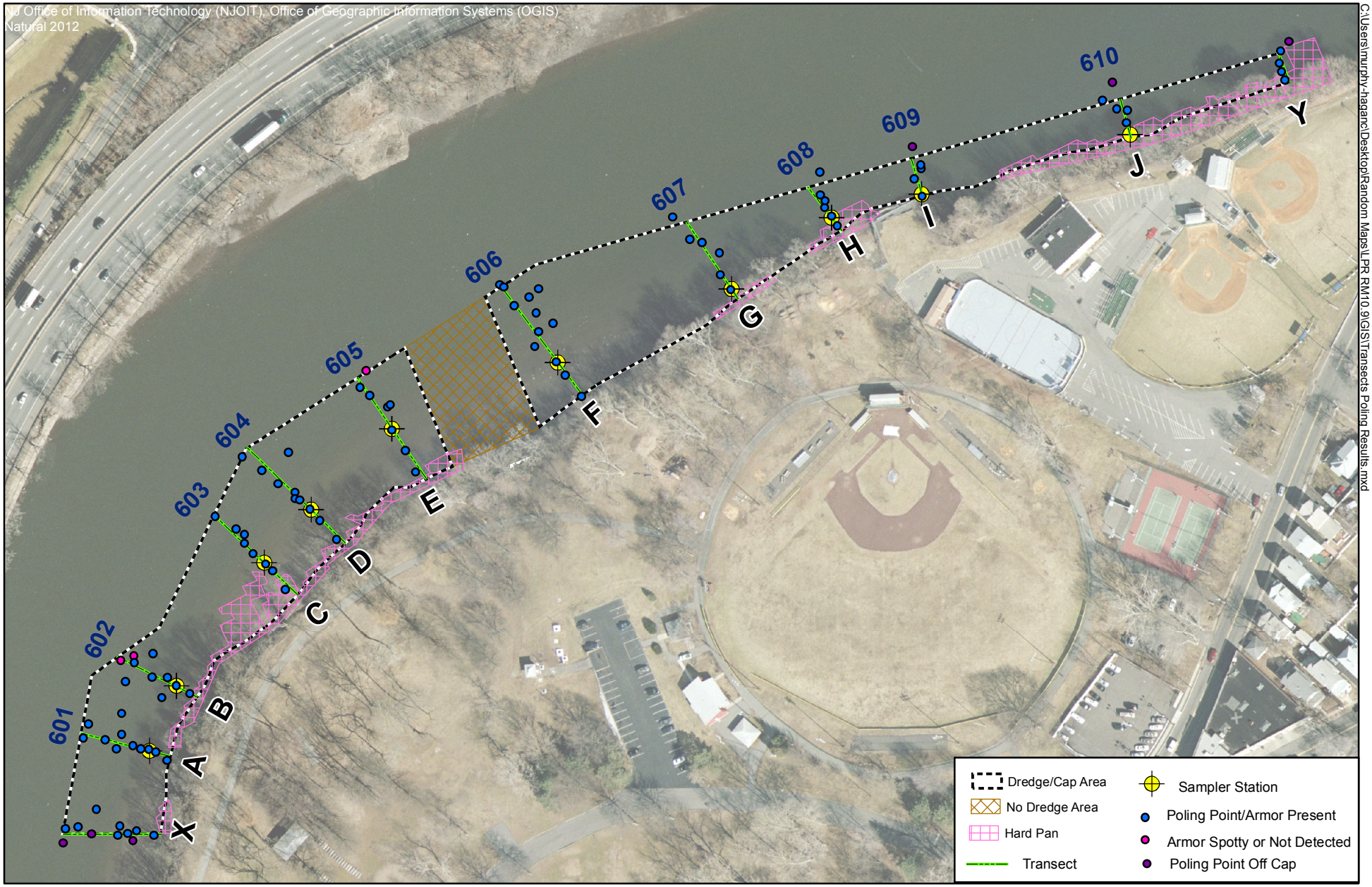


Figure 2
Transect Poling Results, July 6-7, 2016
Mid-Point Check and Cap Inspection
LPR River Mile 10.9 Cap

AECOM

Attachment A

Deployment Photographs
June 3-5, 2016

PHOTOGRAPHIC LOG

Client Name: DMI	**Site Location:** Lower Passaic River (River Mile 10.9)	**Project No.** 60270961

Photo No. 1	**Date:** 06052016

Direction Photo Taken:

Northwest

Description:

Looking from 16A-0601 upriver (toward other stations) around Low tide.

Photo No. 2	**Date:** 06032016

Direction Photo Taken:

South

Description:

Looking downriver from above 16A-0608 around Low tide.

PHOTOGRAPHIC LOG

Client Name: DMI	**Site Location:** Lower Passaic River (River Mile 10.9)	**Project No.** 60270961

Photo No. 3	**Date:** 06032016

Direction Photo Taken:

Northeast

Description:

Looking upriver from near 16A-0608

Photo No. 4	**Date:** 06042016

Direction Photo Taken:

East

Description:

Installed 16A-0601

PHOTOGRAPHIC LOG

Client Name: DMI	**Site Location:** Lower Passaic River (River Mile 10.9)	**Project No.** 60270961

Photo No. 5	**Date:** 06052016

Direction Photo Taken:

North

Description:

Installed 16A-0602

Photo No. 6	**Date:** 06052016

Direction Photo Taken:

Northwest

Description:

Installed 16A-0603
& duplicates

PHOTOGRAPHIC LOG

Client Name: DMI	**Site Location:** Lower Passaic River (River Mile 10.9)	**Project No.** 60270961

Photo No. 7	**Date:** 06042016

Direction Photo Taken:

Northwest

Description:

Installed 16A-0604

Photo No. 8	**Date:** 06042016

Direction Photo Taken:

Northwest

Description:

Installed 16A-0605

PHOTOGRAPHIC LOG

Client Name: DMI	**Site Location:** Lower Passaic River (River Mile 10.9)	**Project No.** 60270961

Photo No. 9	**Date:** 06032016

Direction Photo Taken:

North

Description:

Installed station 16A-0606

Photo No. 10	**Date:** 06032016

Direction Photo Taken:

North

Description:

Installed station16A-0607

PHOTOGRAPHIC LOG

Client Name: DMI	**Site Location:** Lower Passaic River (River Mile 10.9)	**Project No.** 60270961

Photo No. 11	**Date:** 06042016

Direction Photo Taken:

North

Description:

Installed Station 16A-0608

Photo No. 12	**Date:** 06032016

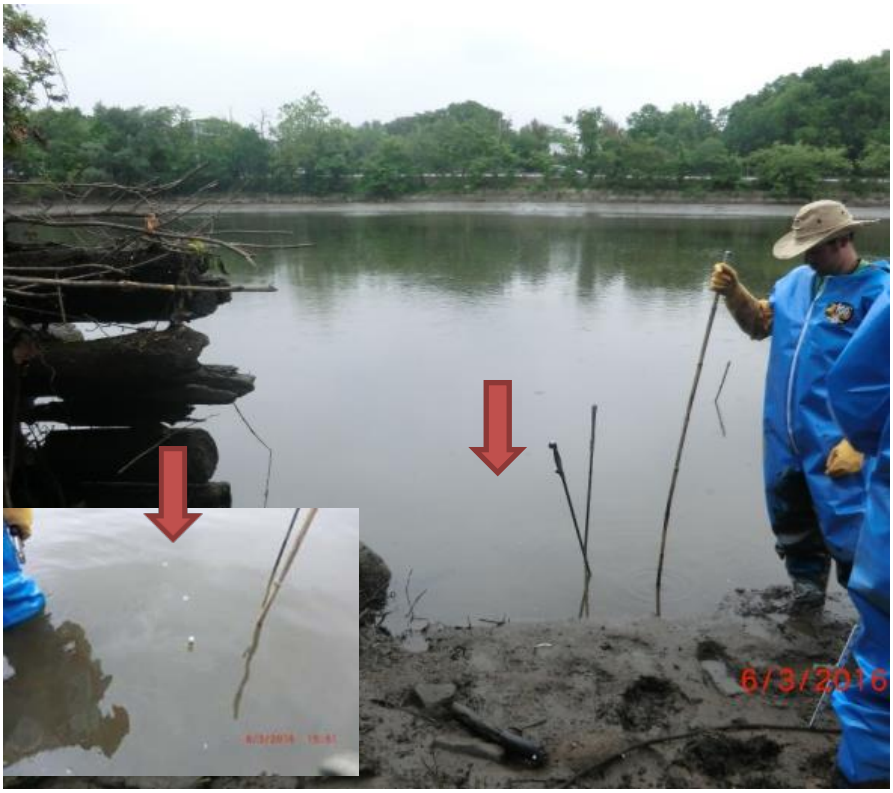
Direction Photo Taken:

North

Description:

Installed Station16A-0609

(Samplers submerged by incoming tide by the time this photo was taken)



PHOTOGRAPHIC LOG

Client Name: DMI	**Site Location:** Lower Passaic River (River Mile 10.9)	**Project No.** 60270961

Photo No. 13	**Date:** 06032016

Direction Photo Taken:

Northeast

Description:

Installed Station16A-0610

Photo No. 14	**Date:** 06032016

Direction Photo Taken:

East

Description:

@ 12:42 PM observed stormwater discharge from culvert located on bank above 16A-0610.

Attachment B

Mid-Program Check Photographs
July 6-7, 2016

PHOTOGRAPHIC LOG

Client Name: DMI	**Site Location:** Lower Passaic River (River Mile 10.9)	**Project No.** 60270961

Photo No. 1	**Date:** 07072016

Direction Photo Taken:

Northwest

Description:

Looking from station 16A-0601 upriver (toward other stations) around low tide.

Photo No. 2	**Date:** 07072016

Direction Photo Taken:

South

Description:

Looking downriver from above station 16A-0608 around low tide.

PHOTOGRAPHIC LOG

Client Name: DMI	**Site Location:** Lower Passaic River (River Mile 10.9)	**Project No.** 60270961

Photo No. 3	**Date:** 07072016

Direction Photo Taken:

Northeast

Description:

Looking upriver from station 16A-0608 around low tide.

Photo No. 4	**Date:** 07072016

Direction Photo Taken:

West

Description:

Station 16A-0601

PHOTOGRAPHIC LOG

Client Name: DMI	**Site Location:** Lower Passaic River (River Mile 10.9)	**Project No.** 60270961

Photo No. 5	**Date:** 07072016

Direction Photo Taken:

Northwest

Description:

Station 16A-0602

Photo No. 6	**Date:** 07072016

Direction Photo Taken:

Northwest

Description:

Station 16A-0603 (Right)
&
Station 16A-0603D (Left)

PHOTOGRAPHIC LOG

Client Name: DMI	**Site Location:** Lower Passaic River (River Mile 10.9)	**Project No.** 60270961

Photo No. 7	**Date:** 07072016

Direction Photo Taken:

North

Description:

Station 16A-0604

Photo No. 8	**Date:** 07072016

Direction Photo Taken:

Northwest

Description:

Station 16A-0605

PHOTOGRAPHIC LOG

Client Name: DMI	**Site Location:** Lower Passaic River (River Mile 10.9)	**Project No.** 60270961

Photo No. 9	**Date:** 07072016

Direction Photo Taken:

North

Description:

Station 16A-0606

Photo No. 10	**Date:** 07072016

Direction Photo Taken:

North

Description:

Station 16A-0607

PHOTOGRAPHIC LOG

Client Name: DMI	**Site Location:** Lower Passaic River (River Mile 10.9)	**Project No.** 60270961

Photo No. 11	**Date:** 07072016

Direction Photo Taken:

North

Description:

Station 16A-0608

Photo No. 12	**Date:** 07062016

Direction Photo Taken:

North

Description:

Station16A-0609

(Samplers installed in water in June. Picture taken 35 min before low tide.)

PHOTOGRAPHIC LOG

Client Name: DMI	**Site Location:** Lower Passaic River (River Mile 10.9)	**Project No.** 60270961

Photo No. 13	**Date:** 07062016

Direction Photo Taken:

North

Description:

Station16A-0610

Photo No. 14	**Date:** 07062016

Direction Photo Taken:

West

Description:

Looking downriver toward station 16A-0609 from station 16A-0610.

Attachment C

August 2016 Check Photographs
August 3, 2016

PHOTOGRAPHIC LOG

Client Name: DMI	**Site Location:** Lower Passaic River (River Mile 10.9)	**Project No.** 60270961

Photo No. 1	**Date:** 08032016

Direction Photo Taken:

West

Description:

16A-0601 at Low tide.

Photo No. 2	**Date:** 08032016

Direction Photo Taken:

West

Description:

16A-0602 at low tide.

PHOTOGRAPHIC LOG

Client Name: DMI	**Site Location:** Lower Passaic River (River Mile 10.9)	**Project No.** 60270961

Photo No. 3	**Date:** 08032016

Direction Photo Taken:

Northwest

Description:

16A-0603 and duplicate at low tide

Photo No. 4	**Date:** 08032016

Direction Photo Taken:

Northwest

Description:

16A-0604 at low tide

PHOTOGRAPHIC LOG

Client Name: DMI	**Site Location:** Lower Passaic River (River Mile 10.9)	**Project No.** 60270961

Photo No. 5	**Date:** 08032016

Direction Photo Taken:

Northwest

Description:

16A-0605 at low tide

Photo No. 6	**Date:** 08032016

Direction Photo Taken:

Northwest

Description:

16A-0606 at low tide

PHOTOGRAPHIC LOG

Client Name: DMI	**Site Location:** Lower Passaic River (River Mile 10.9)	**Project No.** 60270961

Photo No. 7	**Date:** 08032016

Direction Photo Taken:

North

Description:

16A-0607 at low tide

Photo No. 8	**Date:** 08032016

Direction Photo Taken:

North

Description:

16A-0608 at low tide

PHOTOGRAPHIC LOG

Client Name: DMI	**Site Location:** Lower Passaic River (River Mile 10.9)	**Project No.** 60270961

Photo No. **9**	**Date:** 08032016

Direction Photo Taken:

North

Description:

16A-0609

Attachment D

Retrieval Photographs
August 19-22, 2016

PHOTOGRAPHIC LOG

Client Name: Cooperating Parties Group	**Site Location:** Lower Passaic River (River Mile 10.9)	**Project No.** 60270961

Photo No. 1	**Date:** 08202016

Direction Photo Taken:

West

Description:

Station 16A-0601

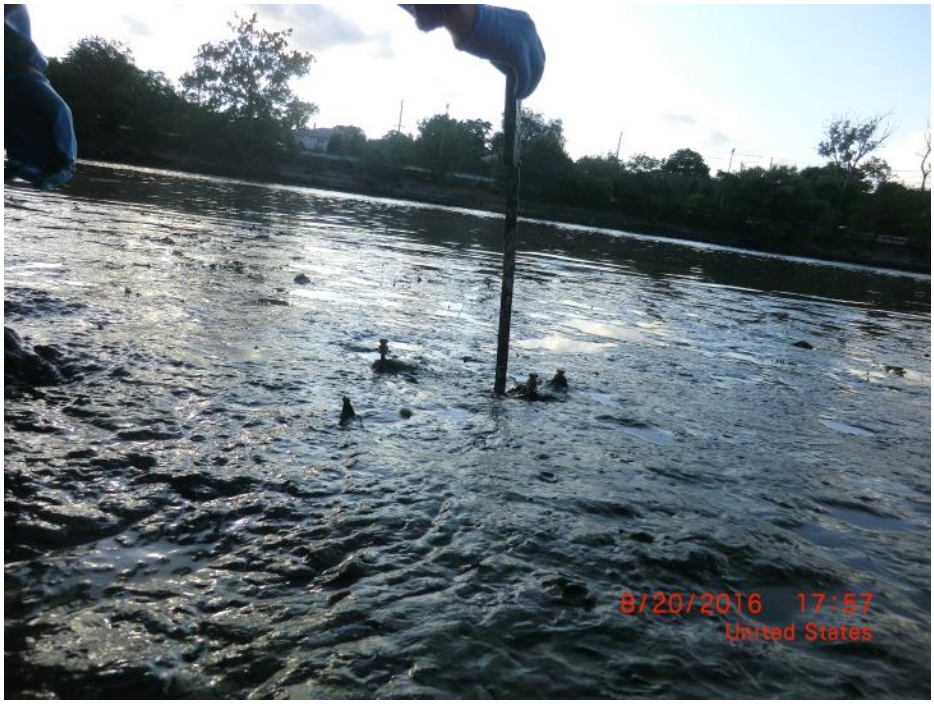


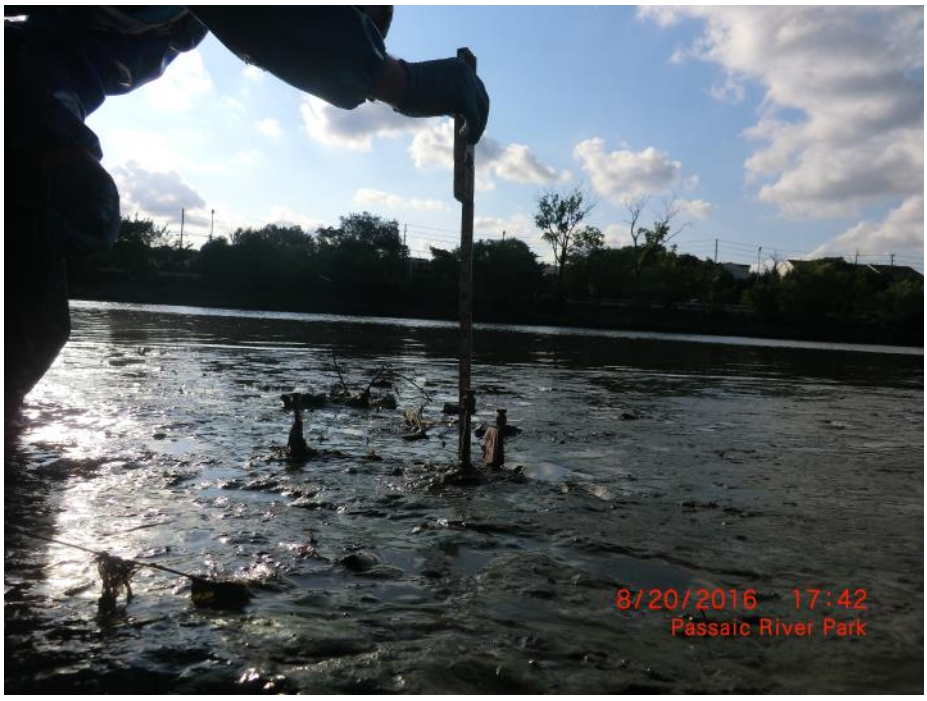
Photo No. 2	**Date:** 08202016

Direction Photo Taken:

Northwest

Description:

Station 16A-0602



PHOTOGRAPHIC LOG

Client Name: Cooperating Parties Group	**Site Location:** Lower Passaic River (River Mile 10.9)	**Project No.** 60270961

Photo No. 3	**Date:** 08202016

Direction Photo Taken:

Northwest

Description:

Station 16A-0603 (Right)
&
Station 16A-0603D (Left)

Photo No. 4	**Date:** 08202016

Direction Photo Taken:

North

Description:

Station 16A-0604

PHOTOGRAPHIC LOG

Client Name: Cooperating Parties Group	**Site Location:** Lower Passaic River (River Mile 10.9)	**Project No.** 60270961

Photo No. 5	**Date:** 08202016

Direction Photo Taken:

Northwest

Description:

Station 16A-0605

Photo No. 6	**Date:** 08192016

Direction Photo Taken:

North

Description:

Station 16A-0606

PHOTOGRAPHIC LOG

Client Name: Cooperating Parties Group	**Site Location:** Lower Passaic River (River Mile 10.9)	**Project No.** 60270961

Photo No. 7	**Date:** 08192016

Direction Photo Taken:

North

Description:

Station 16A-0607

Photo No. 8	**Date:** 08192016

Direction Photo Taken:

North

Description:

Station 16A-0608

PHOTOGRAPHIC LOG

Client Name: Cooperating Parties Group	**Site Location:** Lower Passaic River (River Mile 10.9)	**Project No.** 60270961

Photo No. **9**	**Date:** 08192016

Direction Photo Taken:

North

Description:

Station16A-0609

(Samplers installed in water in June. Picture taken 10 min before low tide.)

Photo No. **10**	**Date:** 08192016

Direction Photo Taken:

North

Description:

Station16A-0610

PHOTOGRAPHIC LOG

Client Name: Cooperating Parties Group	**Site Location:** Lower Passaic River (River Mile 10.9)	**Project No.** 60270961

Photo No. **11**	**Date:** 08202016

Direction Photo Taken:

NA

Description:

Representative photo of sediment sample being collected (station 16A-0604) within 8 inches of Armor layer sampler. Prior to sampler retrieval.

Photo No. **12**	**Date:** 08192016

Direction Photo Taken:

NA

Description:

Representative photo of removed Henry sampler (station 16A-0607).

PHOTOGRAPHIC LOG

Client Name: Cooperating Parties Group	**Site Location:** Lower Passaic River (River Mile 10.9)	**Project No.** 60270961

Photo No. 13	**Date:** 08212016

Direction Photo Taken:

NA

Description:

Removing SPME fibers from Henry sampler

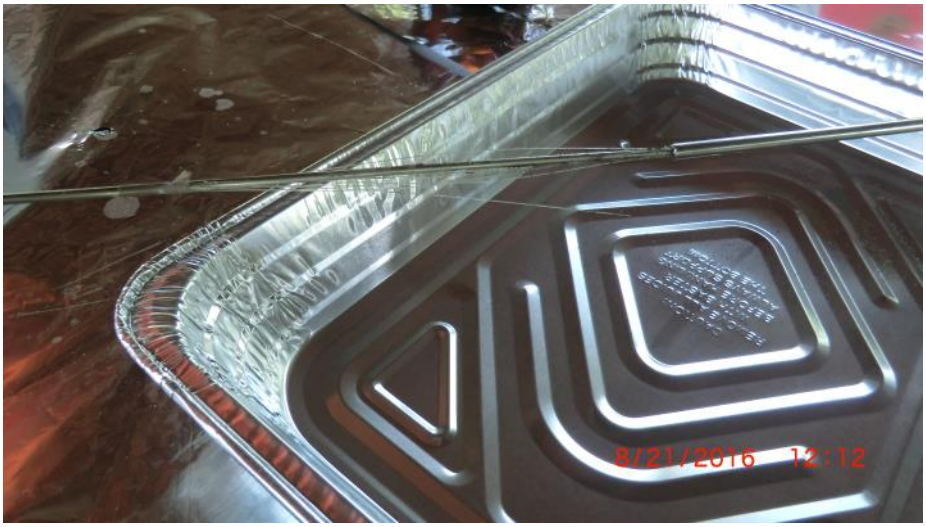


Photo No. 14	**Date:** 08212016

Direction Photo Taken:

NA

Description:

Processing SPME fibers extracted from Henry Sampler.

Attachment E

Example Calculation

Example Calculation for PCB-52 for armor layer sample 16A-0601-E1-AS

PDMS Volume

$$V_{PDMS} = \frac{1}{4}(\pi d_{Core}^{2} - \pi d_{PDMS}^{2})L_{PDMS}$$

Input		
Total Fiber Length (L):	1514.9	mm

Fiber Lengths:								
Sample	Armor Layer		Cap Active Layer		Underlying Sediments		Field Blank	
Sample ID	15A-0602-EA-AS		15A-0602-E1-BS		15A-0602-E1-CS		15A-0602-E1-XF	
Total Fiber Length (L)	1514.9	mm	1594.4	mm	1599.7	mm	1639.7	mm

Core Diameter (d_{core})		PDMS Diameter (d_{PDMS})		Length (L)	Volume (V_{PDMS})	
µm	mm	µm	mm	mm	mm^3	µL
200	0.2	300	0.3	1514.9	59.5	59.5

Concentration in PDMS Sorbent

$$C_{PDMS} = \frac{C_{sample}}{V_{PDMS}}$$

Inputs:		
Sample Result (C_{sample}):	1740.0	pg
PDMS Volume (V_{PDMS}):	59.5	µL

Sample Result (C_{sample})		PDMS Volume (V_{PDMS})		Concentration in PDMS Sorbent (C_{PDMS})			
1740	pg	59.5	µL	29.2	pg/µL	29.2	µg/kg

Pore water Concentration

$$C_{PW} = \frac{C_{PDMS}}{K_{DPMS}}$$

Inputs:		
C_{PDMS}	29.2	µg/kg
K_{PDMS} PCB-52	346737	L/kg

K_{PDMS}			
Constituent	log Kdpms[1]	Kdpms	
Phenanthrene	3.83	6761	L/kg
PCB-52	5.54	346737	L/kg
2,3,7,8-TCDD	5.94	870964	L/kg
[1] From QAPP Worksheet #11			

Concentration in PDMS Sorbent (C_{PDMS})		Kdpms	Pore Water Concentration (C_{PW})			
29.2	µg/kg	346737	8.44E-05	ug/L	84	pg/L

Attachment F

Cap Inspection Photographs
July 6-7, 2016

PHOTOGRAPHIC LOG

Client Name: DMI	**Site Location:** Lower Passaic River (River Mile 10.9)	**Project No.** 60270961

Photo No. 1	**Date:** 07072016

Direction Photo Taken:

Northwest

Description:

Annual Cap Inspection

Looking from station 16A-0601 upriver (toward other stations) around low tide.

Photo No. 2	**Date:** 07072016

Direction Photo Taken:

South

Description:

Annual Cap Inspection

Looking downriver from above station 16A-0608 around low tide.

PHOTOGRAPHIC LOG

Client Name: DMI	**Site Location:** Lower Passaic River (River Mile 10.9)	**Project No.** 60270961

Photo No. 3	**Date:** 07072016

Direction Photo Taken:

Northeast

Description:

Annual Cap Inspection

Looking upriver from station 16A-0608 around low tide.

Photo No. 4	**Date:** 07062016

Direction Photo Taken:

West

Description:

Annual Cap Inspection

Looking downriver toward station 16A-0609 from station 16A-0610.

PHOTOGRAPHIC LOG

Client Name: DMI	**Site Location:** Lower Passaic River (River Mile 10.9)	**Project No.** 60270961

Photo No. 7	**Date:** 07062016

Direction Photo Taken:

South

Description:

Annual Cap Inspection

Shoreline at station 16A-0610 during low tide event.

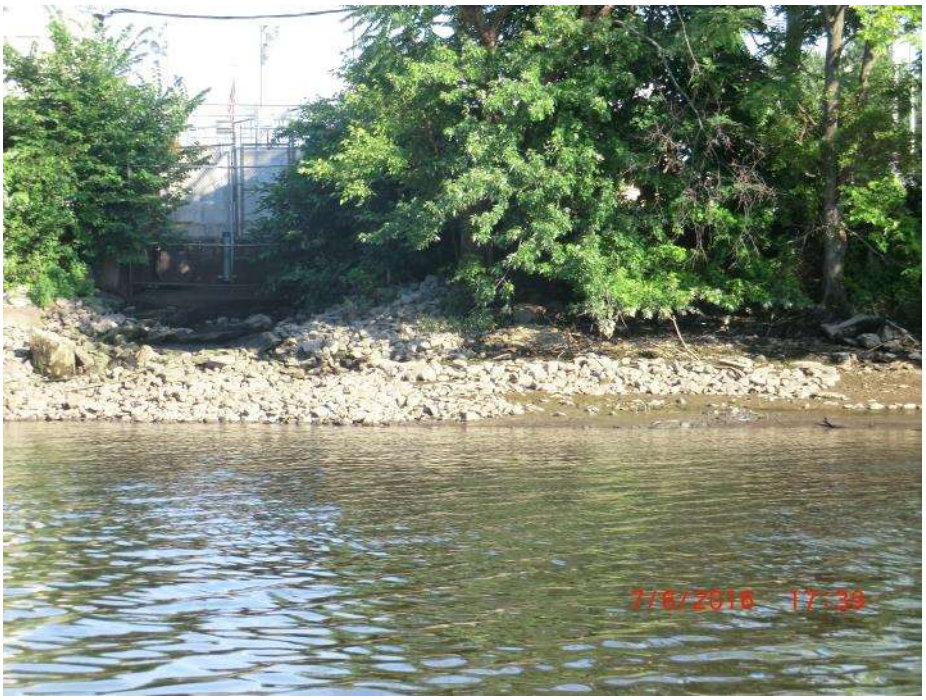


Photo No. 8	**Date:** 07062016

Direction Photo Taken:

South

Description:

Annual Cap Inspection

Shoreline at station 16A-0609 during low tide event.

PHOTOGRAPHIC LOG

Client Name: DMI	**Site Location:** Lower Passaic River (River Mile 10.9)	**Project No.** 60270961

Photo No. 9	**Date:** 07062016

Direction Photo Taken:

Southeast

Description:

Annual Cap Inspection

Shoreline at station 16A-0608 during low tide event.

Photo No. 10	**Date:** 07062016

Direction Photo Taken:

South

Description:

Annual Cap Inspection

Shoreline during low tide event.